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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,629	06/23/2005	Yuichi Tokita	S1459.70075US00	5380

23628 7590 09/08/2008
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EXAMINER	
MCDONALD, RODNEY GLENN	

ART UNIT	PAPER NUMBER
1795	

MAIL DATE	DELIVERY MODE
09/08/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/540,629	TOKITA ET AL.	
	Examiner	Art Unit	
	Rodney G. McDonald	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _30 May 2008_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1,3 and 5-11_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1,3 and 5-11_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _3-20-08_.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 3 and 5-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adachi et al. "Dye-sensitized Solar Cells Using Semiconductor Thin Film Composed of Titania Nanotubes", Electrochemistry, June 2002, Volume 70, No. 6, pp. 449-452 in view of Graetzel et al. (U.S. Pat. 5,350,644), Wariishi et al (U.S. Patent 6,376,765) and Yoshikawa (U.S. Patent 6,586,670).

Regarding claims 1, 11, Adachi et al. teach a dye sensitized photoelectric transfer device prepared by forming a semiconductor layer containing titania nanotubes that are sensitized with a ruthenium dye (see the Experimental pages 449-450). Adachi

et al soaks the titania nanotubes (which are coated on a glass substrate) in an ethanol solution of ruthenium dye for 20 hr the dye-sensitized titania nanotubes (see page 450). It is the Examiner's position that this inherently results in the dye being "retained" by the nanotubes.

Regarding claim 5, the diameter of each nanotube is 10 nm. (See page 450)

Regarding claim 6, the titania nanotubes are formed as anatase crystal. (See Abstract)

Regarding claim 7, there is a semiconductor layer and an electrolyte layer provided between a pair of opposed electrodes. (See Page 450)

Regarding claim 8, there is a semiconductor layer (titania) and an electrolyte layer provided between a transparent conductive substrate (tin oxide) and a conductive substrate as a counter electrode (Pt) of the transparent conductive substrate to generate electric energy between the transparent conductive substrate and the conductive substrate by photoelectric transfer. (See Page 459, 450)

Regarding claim 9, this is a transparent glass substrate having a dope tin oxide conductive film. (See Page 449)

Regarding claim 10, the transfer device is configured as a dye sensitized solar cell. (See page 450)

The difference between Adachi et al. and the present claims is that the dye having no acidic substituents is not discussed (Claims 1, 11) and the photoelectric transfer efficiency being greater than about 10% is not discussed (Claims 1, 11), the titania nanotube retaining at least two kinds of sensitizing dye is not discussed (Claim

3), the particles of the dyes not associating is not discussed (Claims 1, 11) and no suppression of dye association being performed is not discussed (Claims 1, 11).

Regarding the dye having no acidic substituents (Claims 1, 11), Graetzel et al. teach in Table 1 in Examples 7 (i.e. Ru (2, 2'-bipyridyl)$_2$(CN)$_2$) and 8 a dye for a photoelectric transfer device that has no acidic substituents. (See Table 1 Column 9 Examples 7, 8; Column 9 lines 57-59)

Regarding the photoelectric transfer efficiency being greater than about 10% (Claims 1, 11), Graetzel et al. teach in Example 36 achieving a photoelectric transfer efficiency of 11%. (Column 14 lines 24-25) Graetzel et al. teach that the complexes of Examples 1-33 (i.e. see Examples 7, 8 of Table 1) can be used in place of the complexes of Example 36 to achieve a similar result. (Column 16 lines 36-39)

The motivation for utilizing the features of Graetzel et al. is that it allows for producing a photoelectric transfer device with higher efficiency than the conventional device. (Column 14 lines 31-32)

Regarding claim 3, Wariishi et al teaches dyes that can be used in dye-sensitized solar cells (see col. 26, lines 56 through col. 54). Many dyes, such as dyes S-1, S-3 to S-20, S-22, S-23, S-27 to S-29, S-33, S-37 and S-41, among the dyes illustrated by Wariishi et al do not contain acidic groups (see col. 47 through col. 52). Wariishi et al also teaches that two or more dyes may be used as a mixture to obtain a large photoelectric conversion region and a high photoelectric conversion efficiency (see col. 26, lines 59-62). Yoshikawa also teaches dyes that can be used in dye-sensitized solar cells, such as dye M-1 at col. 24, which does not contain acidic groups. Yoshikawa also

teaches that two or more dyes may be used as a mixture to obtain a large photoelectric conversion region and a high photoelectric conversion efficiency (see col. 20, lines 62-66).

Regarding claim 1, Yoshikawa teaches that a colorless compound may be co-adsorbed together with the dyes to weaken an interaction between the dyes, such as association (see col. 13, lines 42-49). Thus, even if there was association of dyes, a skilled artisan would know how to weaken this interaction so that there is essentially no association. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a dye that has no acidic groups as the sensitizing dye because such dyes are conventional in the art, as shown by Wariishi et al. and Yoshikawa.

Regarding the no suppression of dye association being performed (Claims 1, 11), as discussed above Wariishi et al. and Yoshikawa teach utilizing dyes containing no acidic substituents. These dyes are the same dyes required by Applicant and therefore would not associate with each other. (See Wariishi et al. and Yoshikawa discussed above)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Adachi et al. by utilizing the features of Graetzel et al. because it allows for producing a photoelectric transfer device with higher efficiency than the conventional device. It would also have been obvious to one of ordinary skill in the art at the time the invention was made to have used mixtures of dyes because with mixtures of dyes a large photoelectric conversion region and a high

photoelectric conversion efficiency can be obtained, as shown by Wariishi et al and Yoshikawa. Furthermore, it would also have been obvious to one of ordinary skill in the art at the time the invention was made to have prevented association of the dyes because it is known in the art that a colorless compound may be co-adsorbed together with the dyes to weaken an interaction between the dyes, such as association, as taught by Yoshikawa and that if the dyes contained no acidic substituents as required by Applicant's claims there would be no dye association of dyes.

Response to Arguments

Applicant's arguments filed February 7, 2008 have been fully considered but they are not persuasive.

In response to the argument that none of the cited references teach a dye-sensitized photoelectric transfer device comprising a sensitizing dye having particles which do not associate with each other and wherein no suppression of dye association is performed, it is argued that while Yoshikawa teach that a colorless compound may be co-adsorbed together with the dyes to weaken an interaction between the dyes, such as association it is pointed out that this is optional (i.e. "may contain an additive" Column 13 lines 42-46) and as set forth in the rejection the Examiner implied (i.e. "even if there was an association of dyes") that a dye having no acidic substituents would have no association since the dyes utilized are the same as required by Applicants. Furthermore, Applicant's specification states that there is "no need to introduce acidic substituents into the sensitizing dye since it suppresses association of the sensitizing dye particles". Thus suggesting that if a dye having no acidic substituents was used as

suggested by Wariishi et al. and Yoshikawa that there would be no suppression of dye association. (See Adachi et al., Wariishi et al. and Yoshikawa)

In response to the argument that the prior art does not teach suppression of dyes, it is argued as discussed above that since Yoshikawa suggest utilizing the same dyes as applicant requires that no association of dyes would occur. The use of the additive is optional as discussed above. (See Yoshikawa discussed above)

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M-Th with every Friday off..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Rodney G. McDonald/
Primary Examiner, Art Unit 1795

Rodney G. McDonald
Primary Examiner
Art Unit 1795

RM
September 3, 2008